

What is claimed is:

1. A module for separating a multi-component fluid comprising:
 - a hollow shell having a hermetic enclosure;
 - a plurality of separation assemblies in side by side relationship disposed in the shell;
 - each separation assembly comprising a plurality of elongated membrane elements, at least a portion of each membrane element comprising a semipermeable surface to permit selective permeation of one or more components of the multi-component fluid into the membrane element;
 - one end of the membrane elements in a separation assembly being attached to and hermetically sealed to an inlet manifold and the opposing end being attached to and hermetically sealed to an outlet manifold, at least one of the manifolds being unrestrained, thereby permitting axial movement of each membrane element in response to temperature changes;
 - the shell having at least one inlet conduit for introducing the multi-component fluid into the shell for treatment at a first pressure and at least one exit conduit for passage of treated multi-component fluid out of the shell;
 - at least one manifold from each separation assembly being in fluid communication with a manifold from one other separation assembly, the plurality of separation assemblies being in fluid communication with each other; and
 - at least one exit conduit for passage of permeate at a second pressure being lower than the first pressure from one of the manifolds out of the shell.
2. The module of claim 1 wherein the shell is generally cylindrical having an axial length.
3. The module of claim 2 wherein the plurality of membrane elements are membrane tubes that are substantially parallel to the axial length of the shell.

4. The module of claim 1 further comprising an additional conduit for passage of sweep gas from outside the shell into one of the manifolds.
5. The module of claim 1 wherein the separation assemblies are stacked in a disk-like configuration.
6. The module of claim 5 further comprising an additional conduit for passage of sweep gas from the outside the shell into one of the manifolds.
7. The module of claim 1 wherein a sealing material that is substantially leakproof to the multi-component fluid at least partly occupies the space between the exit conduit of the permeate and the shell.
8. The module of claim 1 further comprising spacer members between and spacing each adjacent separation assembly.
9. The module of claim 1 wherein the membrane element comprises a semipermeable membrane layer formed on a microporous support tube.
10. The module of claim 9 wherein the membrane layer is formed from a porous silica.
11. The module of claim 9 wherein the membrane layer has a pore size ranging from about 0.1 Å to about 10 Å.
12. The module of claim 1 wherein a plurality of baffles are disposed substantially perpendicular to at least one of the membrane elements and are effective to distribute multi-component fluid across the outer surface of the membrane elements.
13. The module of claim 2 wherein the cylindrical shell has oblate ends.
14. The module of claim 1 wherein the first pressure is above 1,200 psia.
15. The module of claim 1 wherein at least a portion of the shell is made of a first material and at least a portion of each membrane element is made of a second

material, the first and second materials having different coefficients of thermal expansion.

16. The module of claim 9 wherein the membrane layer is formed from a zeolite.
17. A module for separating a multi-component fluid comprising:
 - a chamber-defining, cylindrical shell having oblate end sections formed integrally with the cylindrical portion, at least a portion of the shell being formed of a first material;
 - a plurality of stacked separation assemblies in side by side relationship disposed in the shell;
 - each separation assembly comprising a plurality of elongated, substantially parallel, membrane elements, at least a portion of each membrane element comprising a wall being adapted to separate the multi-component fluid into permeate and retentate streams, at least a portion of the membrane being formed of a second material, said first and second materials having different coefficients of thermal expansion;
 - one end of each membrane element being attached to and hermetically sealed to a first manifold and the opposing end of each membrane element being attached to and hermetically sealed to a second manifold, one or both the first and second manifolds being unrestrained in the axial direction of the shell;
 - the shell having a first inlet conduit for introducing the multi-component fluid into the shell for treatment at a first pressure and a first exit conduit for passage of treated multi-component fluid out of the shell;
 - the first manifold of one separation assembly being in fluid communication with the first manifold of an adjacent separation assembly and the second manifold of one separation assembly being in fluid communication with the second manifold of an adjacent separation assembly, whereby the plurality of separation assemblies are in fluid communication with each other; and

-15-

the shell having a second inlet conduit for introducing a sweep gas into the second manifold and a second outlet for passage of permeate from the first manifold out of the shell.